

RELIABILITY REPORT
FOR
MAX1446EHJ+
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX1446EHJ+ successfully meets the quality and reliability standards required of all Maxim products. In addition, Maxim's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim's quality and reliability standards.

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I. Device Description

A. General

The MAX1446 10-bit, 3V analog-to-digital converter (ADC) features a fully differential input, a pipelined 10-stage ADC architecture with digital error correction and wideband track and hold (T/H) incorporating a fully differential signal path. This ADC is optimized for low-power, high dynamic performance applications in imaging and digital communications. The MAX1446 operates from a single 2.7V to 3.6V supply, consuming only 90mW while delivering a 59.5dB signal-to-noise ratio (SNR) at a 20MHz input frequency. The fully differential input stage has a 400MHz, -3dB bandwidth and may be operated with single-ended inputs. In addition to low operating power, the MAX1446 features a 5 μ A power-down mode for idle periods. An internal 2.048V precision bandgap reference is used to set the ADC full-scale range. A flexible reference structure allows the user to supply a buffered, direct or externally derived reference for applications requiring increased accuracy or a different input voltage range. Lower and higher speed, pin-compatible versions of the MAX1446 are also available. Refer to the MAX1444 data sheet for a 40Msps version, the MAX1448 datasheet for an 80Msps version, and the MAX1449 datasheet for a 105Msps version. The MAX1446 has parallel, offset binary, three-state outputs that can be operated from 1.7V to 3.3V to allow flexible interfacing. The device is available in a 5mm x 5mm, 32-pin TQFP package and is specified over the extended industrial (-40°C to +85°C) and automotive (-40°C to +105°C) temperature ranges.

II. Manufacturing Information

A. Description/Function:	10-Bit, 60Msps, 3.0V, Low-Power ADC with Internal Reference
B. Process:	TS35
C. Number of Device Transistors:	
D. Fabrication Location:	Taiwan
E. Assembly Location:	Philippines
F. Date of Initial Production:	July 22, 2000

III. Packaging Information

A. Package Type:	32L TQFP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-2101-0024 / A
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	1
J. Single Layer Theta Ja:	N/A
K. Single Layer Theta Jc:	N/A
L. Multi Layer Theta Ja:	53.5°C/W
M. Multi Layer Theta Jc:	10°C/W

IV. Die Information

A. Dimensions:	85 X 87 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.35μm
F. Minimum Metal Spacing:	0.35μm
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- A. Quality Assurance Contacts: Richard Aburano (Manager, Reliability Engineering)
Don Lipps (Manager, Reliability Engineering)
Bryan Preeshl (Vice President of QA)
- B. Outgoing Inspection Level: 0.1% for all electrical parameters guaranteed by the Datasheet.
0.1% For all Visual Defects.
- C. Observed Outgoing Defect Rate: < 50 ppm
- D. Sampling Plan: Mil-Std-105D

VI. Reliability Evaluation

A. Accelerated Life Test

The results of the biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{1000 \times 4340 \times 158 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

(where 4340 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$$\lambda = 1.3 \times 10^{-9}$$

$$\lambda = 1.3 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maxim-ic.com/qa/reliability/monitor>. Cumulative monitor data for the TS35 Process results in a FIT Rate of 0.11 @ 25C and 1.93 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing

The AC12-2 die type has been found to have all pins able to withstand a transient pulse of:

ESD-HBM:	+/- 1500V per JEDEC JESD22-A114
ESD-CDM:	+/- 750V per JEDEC JESD22-C101

Latch-Up testing has shown that this device withstands a current of +/- 250mA.

Table 1
Reliability Evaluation Test Results

MAX1446EHJ+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C	DC Parameters	78	0	Q43CCA016C, D/C 0737
	Biased	& functionality	80	0	Q43AAQ003B, D/C 0135
	Time = 1000 hrs.				

Note 1: Life Test Data may represent plastic DIP qualification lots.